CTTRA Object Model Extension Proposal

CTTRA VIII

Rick Kendall / Joe McMorrow
(805)739-1546 / (703)578-6575

Agenda

- Introduction
- The Problem
- The Effort
- The Process
- The Product
- TSPI CE Example
- Reuse
- The End Result

The Problem

TENA Technical Reference Architecture (TRA) Discussions at CTTRA VII

- Is it Usable?
- Is it Applicable at “My” Range?
- Where (in the TRA) is the “Application”:
  - e.g., The TSPI System?,
  - The Telemetry System?, etc.

The Effort

- Sponsor: OSD/DTSEE/ R&R
- Guidance:
  - Apply:
    - The TENA TRA as of CTTRA VII
    - The DMSO HLA RTI
    - Range Systems and OO Experience
  - Develop Design for:
    - An Example Architecture for
    - An Application Area (TSPI Computation)
- Note: Product NOT part of, nor endorsed by the FI2010 Project

The Process

- Methodology: OOA/OOD
- Unified Modeling Language (UML)
  - Use Cases (Software Perspective)

    Identification of Objects
  - Class Diagrams

    Definition of Structure, Attributes, Methods
  - Event Traces

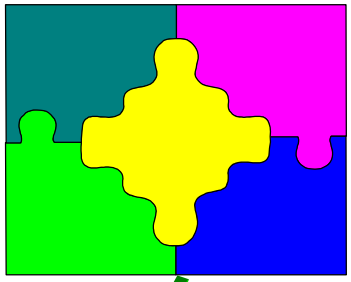
    Behavior & Relationships
  - Refine through Iteration

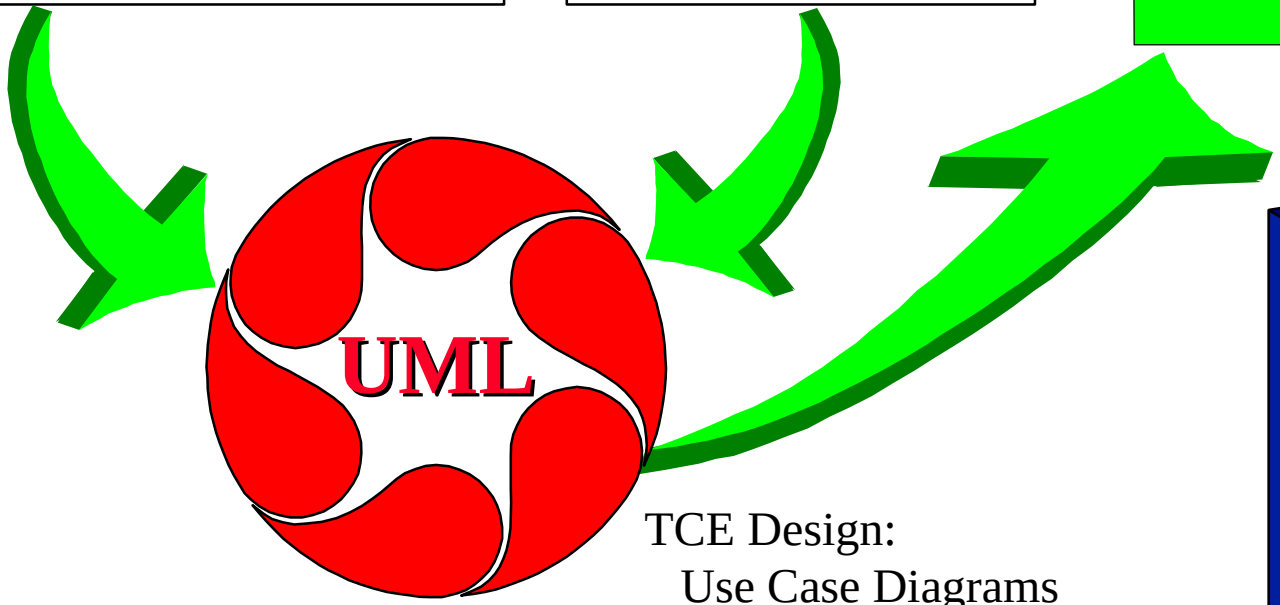
    Object Generalization

The Process

Systems Specs:
RCCS II,
BFTF IFDAPS TSPI,
PAX Nav. Tech., etc.

Architecture Stds:
TENA TRA,
DMSO HLA RTI,
DR-19, etc.





TCE Design:
Use Case Diagrams
Class Diagrams
Event Trace Diagrams
Software Design Description

The Product

- TSPI Computation Element Design
- Evaluation of TRA Objects
  - Information Exchange
- In Context of FI 2010 Objectives
  - Improve Range Interoperability / Connectivity
    - **Inter**-Range Interoperability
    - **Intra**-Range Interoperability
  - Enhance Reusability of Range Software

Basic TSPI CE Functions

- Define / Setup Mission
- Initialization
- Control TSPI Sources (Radar, etc.)
- Acquire TSPI Reports
- Estimate Best Trajectories (BET)
- Provide Mission Evaluation Computations
- Distribute TSPI Tracks to TSPI Consumers

  (Displays, Archiving, Other CE Systems, etc.)

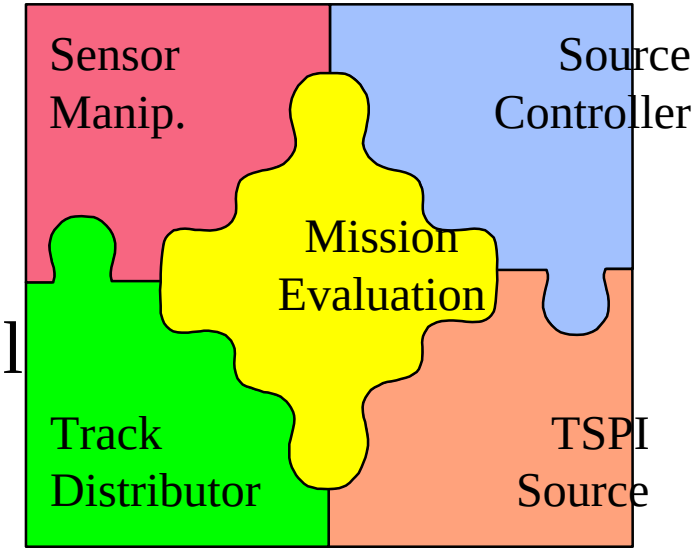
TSPI CE Design

Key Objects:

- **Information Exchange**
  - Participants
  - Sensors
  - Tracks
  - Site
  - Geo Information
- **Application Objects**
  - TSPISource
    - Generates Tracks
    - Estimate Best Traj.
  - SourceController
    - Hardware Interfaces
    - Standardized Info. Exchg.
  - Mission Evaluation
  - Track Distributor
- **Sensor Manipulation**
  - MeasurementBuffer
  - MeasSet
  - MeasSetIterator
  - DatumRefinement
  - TSPI Derivations

TCE Base Classes

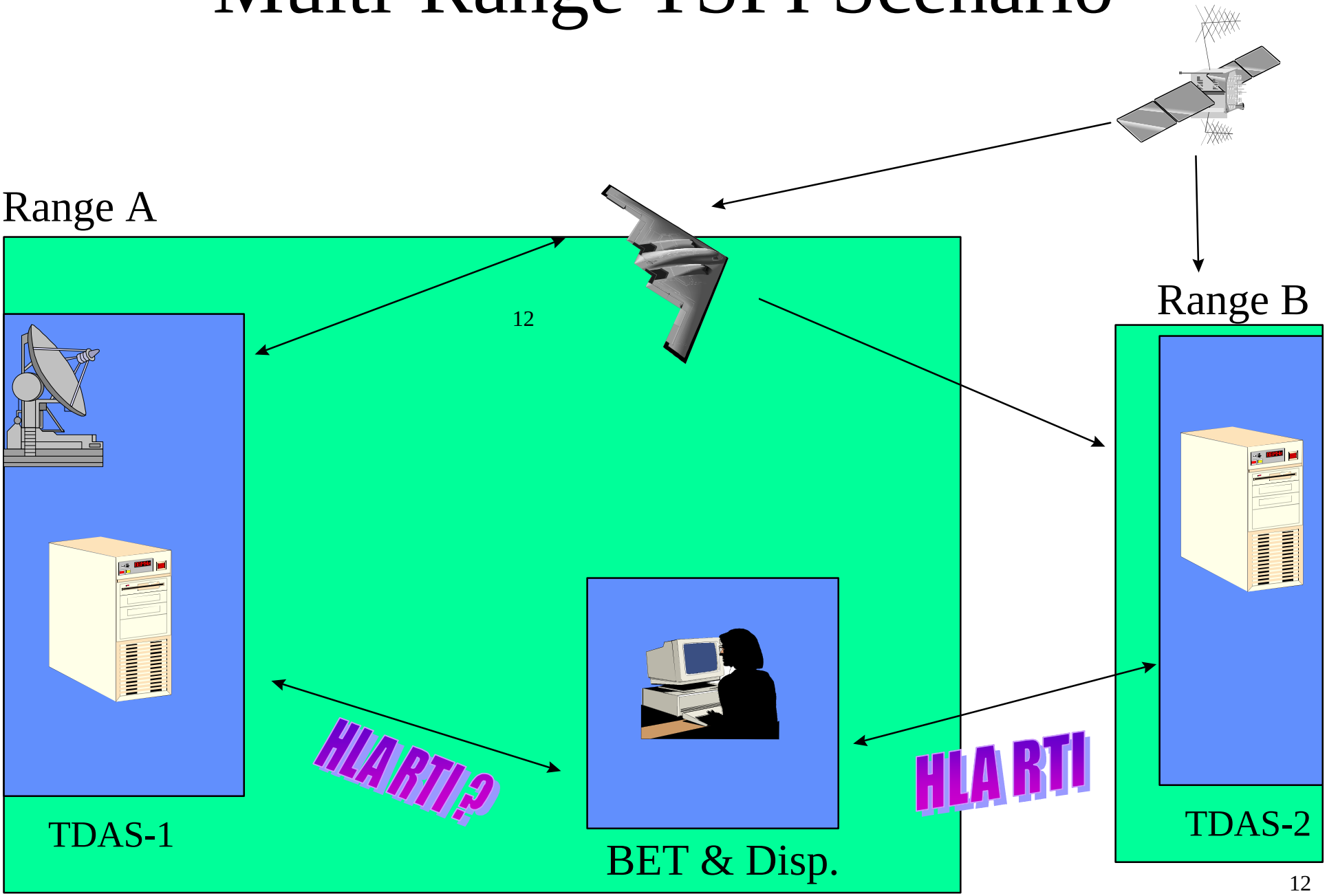
- Source Controller
  - HLA Federate Ambassador
  - Link Controller
    - Hardware Specific Instances
- Mission Evaluation
  - SUT/TP Performance Eval.
  - Safety of Flight / Range Control
  - Logical Range Control
- Track Distributor
  - HLA Distribution
  - Link Distributor
    - Hardware Specific Instances



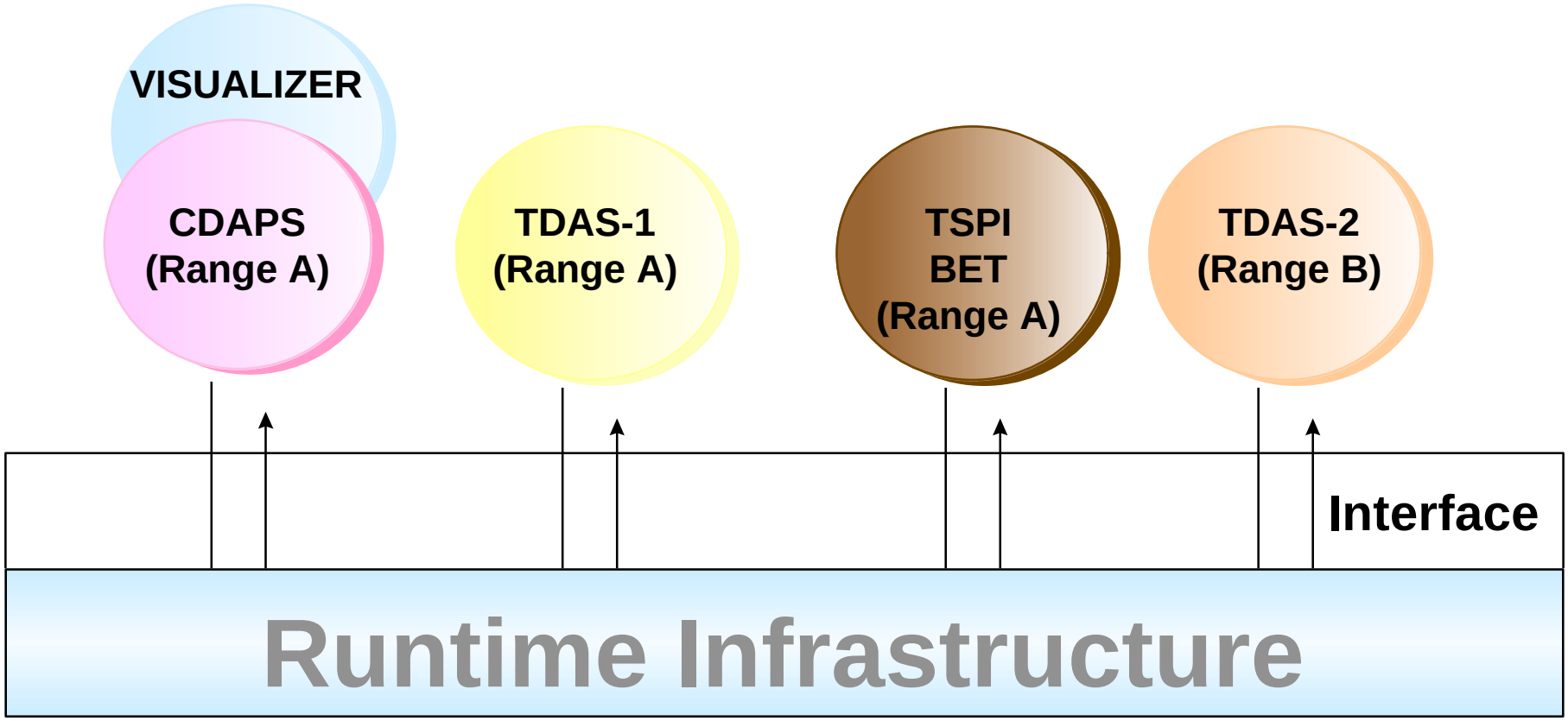
TSPI Example

- Track an Aircraft Across Two Ranges
- Range A: Radar Source
- Range B: GPS Source
- Range A: Estimate Best Trajectory
- Range A: Monitor Mission Space

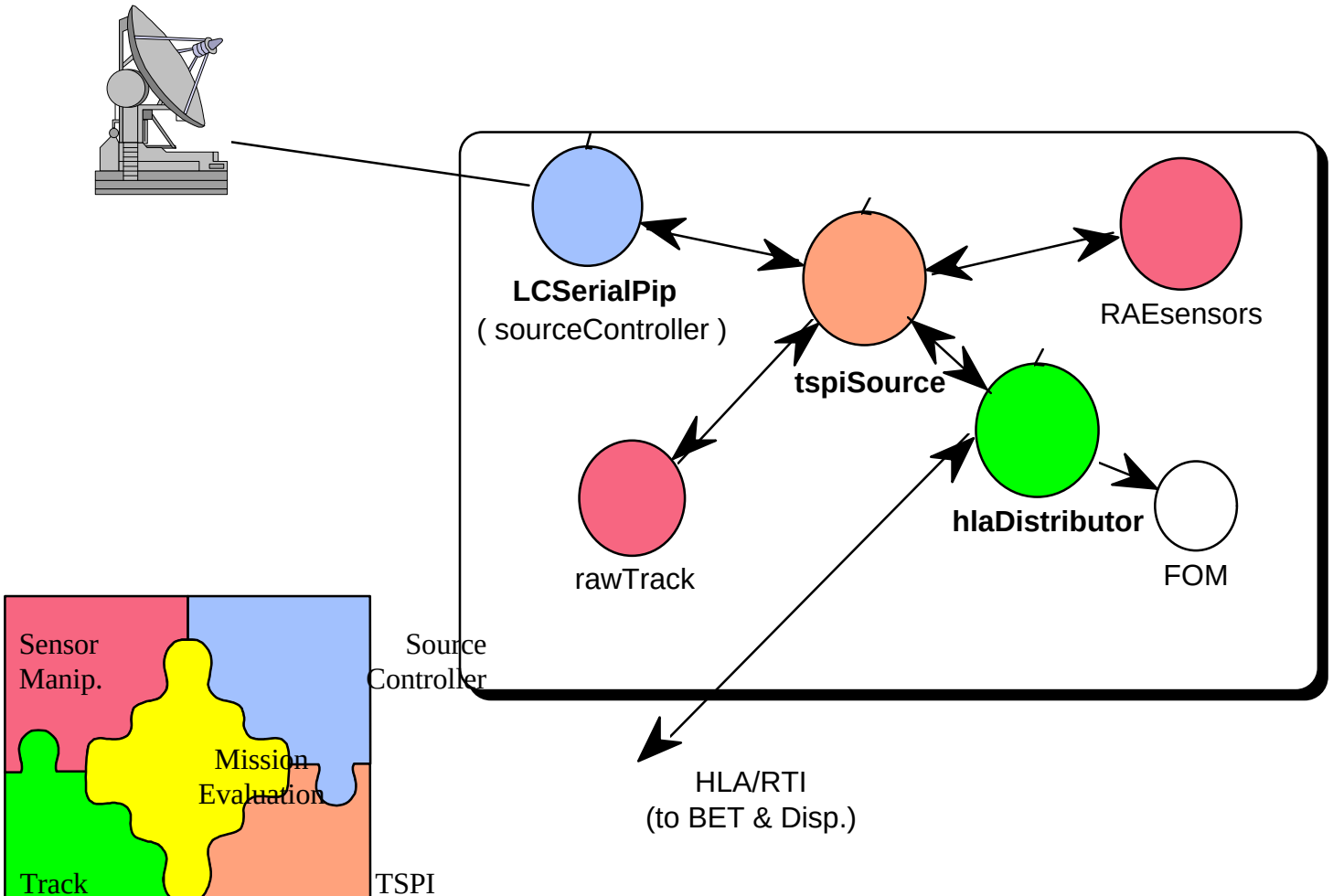
Multi-Range TSPI Scenario



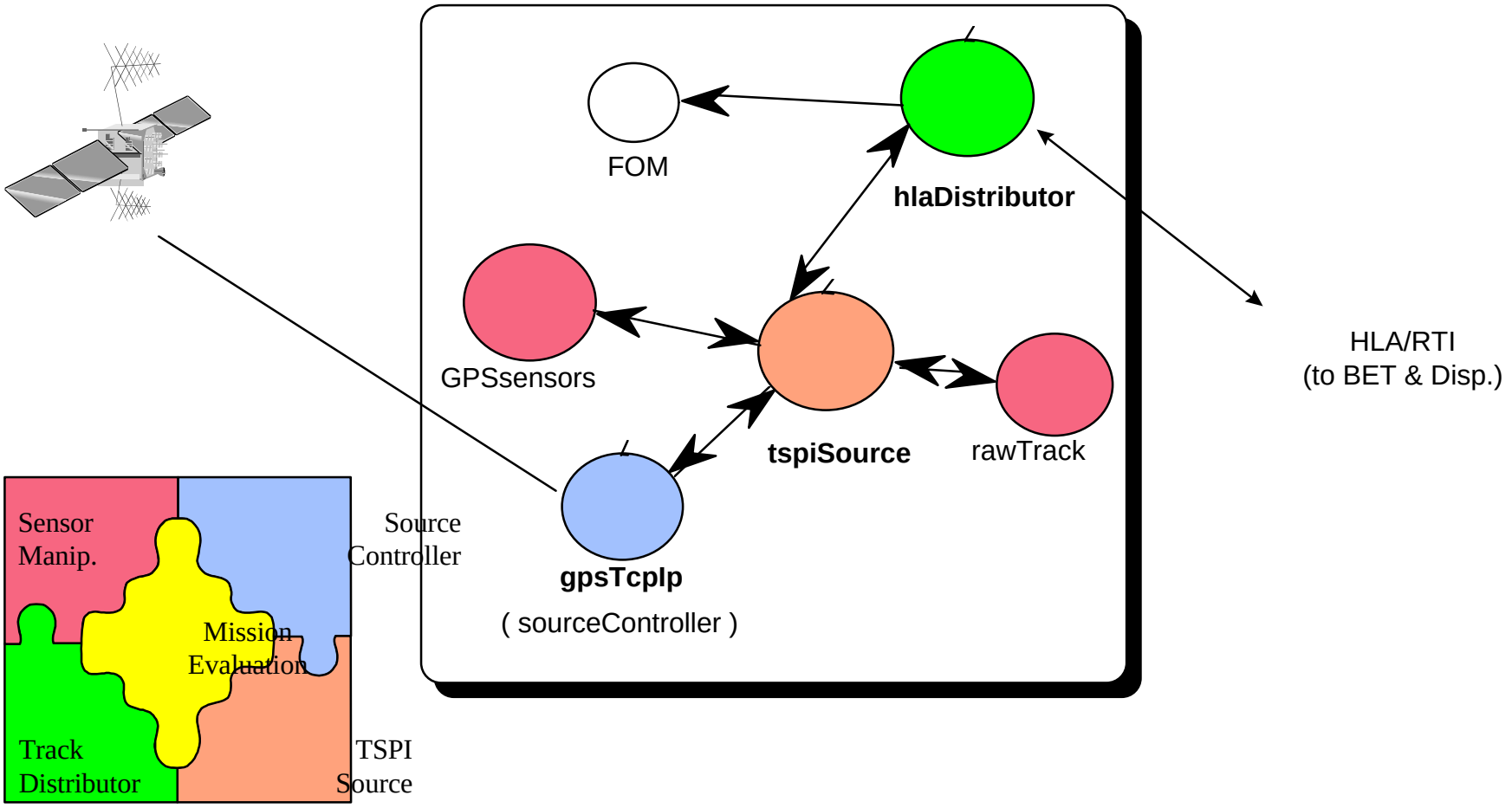
HLA Perspective



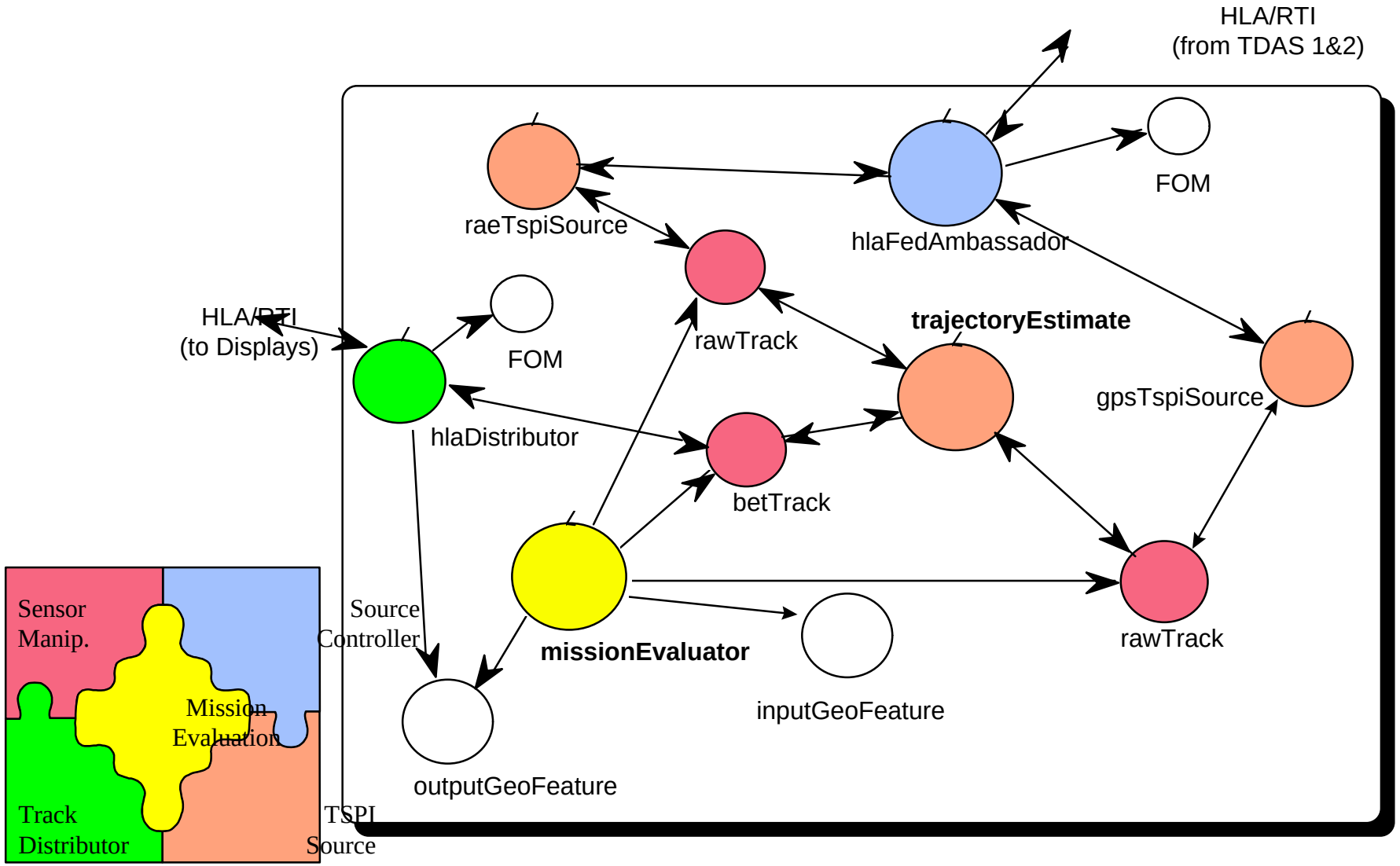
TDAS-1 TCE Objects



TDAS-2 TCE Objects



Mission Evaluation Objects



REUSE

- Information Exchange Reuse
  - One of FI 2010 Project's Current Objectives
- Application Object Reuse
  - FI2010 Objective
  - Key Benefit of TSPI CE OO design approach
  - Requires Coordination & Standardization
  - Must allow for Embedded Legacy Code
    - e.g. BET Filters, Mission Eval., Displays, etc.

Possible New TRA Objects

- Classes Supporting the Sensor Class (Manipulation)
  - Measurement Buffer
    - Management of and Access to Measured Values
  - Measurement Set
    - M&A of Sets of Measurement Buffers
      (e.g. Range, Azimuth, Elevation, and Derivatives)
  - Measurement Set Iterator
    - M&A of Measurement Sets, Including Time Correlation.
  - Datum Refinement
    - Acquisition and Conversion to Usable Format.
- TSPI Specific Classes
  - Track - Derived from MeasSet
  - Track Iterator - Derived from MeasSetIterator

The End Result

- Is the TENA TRA Usable?
  - YES. The TRA has Object Definitions Supporting Range Interoperability / Connectivity.
- Is it Applicable at “My” Range?
  - Applicable for Connecting Range Assets.
  - **Inter-** and **Intra-** Range Interoperability.
- Where (in the TRA) is the “Application”:
  - The TRA Doesn’t Contain Application Objects (yet)
  - The TRA, TENA CORE, & DMSO HLA Support Applications Development through Standardization.

Recommendations

- Leverage the Effort put into the TSPI CE SDD
- Examine TSPI CE Development Methodology
  - Appropriate for TRA Definition & Extension?
  - Appropriate for Other Range Domains?
- Potential FI 2010 Follow-on
  - Incorporate Identified Objects into the TENA TRA
  - Build a TCE
  - Elicit Community Acceptance & Involvement
- Community Participation is Critical
  - Define Application Reuse Policy & Infrastructure
  - Fashion After Existing DTC Exercises